

Attitude Control Optimisation Tool

Code: 21/24

Company: KISPE Space Systems Limited

Location: Farnborough, Hampshire

Company Description:

KISPE was established in 2016 as a programme, technology and systems engineering company working in the electronics, telecommunications and space sectors, working with its customers on the execution or implementation of their business ideas; from early inception and business planning activities, through to design, manufacture, integration, test and operations. KISPE is also active in the generation and delivery of specialist training and development and the provision of consultancy services.

KISPE's vision is to advance the responsible and sustainable use and exploitation of space and to stimulate the development of space-based applications and services. The company identifies innovative engineering, programmatic and business solutions to address challenging programme requirements, drawing on significant experience in the design, development and operation of space systems, and leveraging cutting edge, disruptive technologies developed in other fields.

In addition to its client programmes, including several to develop small satellite systems and services, the company invests into its own research and development. KISPE initiated the Open Source Satellite Programme to develop a fully open source, next generation, 25-250kg class microsatellite platform and community. The aim is to significantly reduce the price:performance point of highly capable small satellite systems, to stimulate and nurture a community of like-minded parties, and to provide a solid small satellite design foundation on which others can build.

KISPE actively provides early careers opportunities to school age and university students and has provided over 15 work experience and internships, including SPINternships in the past two academic years, in disciplines ranging from engineering to space law.

Project Description:

KISPE Space have identified the need for an attitude control optimisation tool which would calculate the optimal values for a quaternion-based, PID controller's gains. Such a tool would reduce the time needed to manually tune the controller and ensure the optimal performance of a satellite's attitude control system is achieved.

During the development of a satellite's attitude control system, the algorithms must be tested to ensure that they provide the required level of control over its rotational state. This testing can be completed by modelling the attitude dynamics of the spacecraft and then

tuning the controller for the specific mass properties and attitude control requirements of the mission.

Therefore, the aim of this project is to develop software in Matlab/Simulink that will automatically tune an attitude control algorithm using optimisation techniques. The tool will be used to calculate the optimal gain values for a satellite attitude simulator already developed by KISPE. The work will entail:

1. Capturing the requirements for the attitude control optimisation tool.
2. Selection of the optimisation technique best suited to the problem (e.g. Monte Carlo method, genetic algorithm optimisation, etc.).
3. Development of the optimisation software in Matlab/Simulink.
4. Writing documentation for the optimisation software.
5. Testing and validation of the optimisation tool using KISPE's satellite attitude simulator.

A key aim of this project is to develop the optimisation tool such that it is relatively agnostic of the software it is optimising in order to allow for future advances in KISPE's attitude modelling and simulation capabilities.

Applicant Specification:

KISPE is seeking candidates that are enthusiastic, inquisitive, motivated, and self-starting to come and join our team during summer 2021. The company blends the knowledge and experience of a highly skilled team who have designed, build and operated many satellite missions, with a small company environment, a collaborative and disruptive ethos, and a desire to stimulate the utility and application of space, and to do things differently. The work placement will be at the KISPE facilities in Farnborough, Hampshire and via remote working as appropriate.

Minimum Requirements:

- To be undertaking further education in the following disciplines: Engineering, Computer Science, Physics / Maths or similar.
- UK passport holder.*
- Older than 18 years of age.*
- Quick learner, curious and creative
- Able to work independently and as part of a team.
- Be open to new challenges.
- Have knowledge of aerospace or aeronautical engineering.
- Have knowledge of programming and simulation software.

(* Site access requirement)

Preferred Additional Requirements:

- Have experience using Matlab and Simulink to solve engineering problems.

Further details:

8 weeks minimum fixed term contract to be agreed with successful candidate. Virtual Induction Event to be held on 21 June, 2021. Ideally to complete before the start of the next academic year. Salary is £1,500 per calendar month gross.

Closing Date for Applications: 5pm Wednesday 12 May

Applications should be made through the online form attaching a CV, before the closing date. Please note that elements of the form left incomplete will be deemed to render the application ineligible. They will be checked for eligibility and forwarded to the employer.